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PROBLEMS FOR SOLUTION.

ALGEBRA.

180. Proposed by R. D. CARMICHAEL, Anniston, Ala.

Find values of x , y , z , and u satisfying the equations

$$\begin{aligned}x+y+z+u &= 10 \dots [1], \\x^2+y^2+z^2+u^2 &= 30 \dots [2], \\x^3+y^3+z^3+u^3 &= 100 \dots [3], \\x^4+y^4+z^4+u^4 &= 354 \dots [4].\end{aligned}$$

181. Proposed by A. H. HOLMES, Brunswick, Maine.

Sum the series, $1 + 2^m + 3^m + 4^m + \dots + n^m$.

182. Proposed by O. L. CALLICOTT, Gettysburg, S. Dak.

Find the value of $\sqrt[1]{2} \sqrt[3]{2} \sqrt[4]{2} \sqrt[5]{2} \dots \sqrt[1000]{2}$.

GEOMETRY.

313. Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

Prove that an algebraic curve of odd degree which is symmetrical with respect to a center has the center on the curve.

314. Proposed by F. ANDEREGG, A. M., Professor of Mathematics, Oberlin College, Oberlin, Ohio.

Find the area of the triangle bounded by the lines $l^a + m^b + n^r = 0$; $l'a + m'\beta + n'r = 0$; $l''a + m''\beta + n''r = 0$, where a stands for $x \cos a + y \sin a - p$, etc. [See Salmon's *Conic Sections*, 6th ed.]

315. Proposed by ROBERT E. MORITZ, Ph. D., University of Washington.

Given the area of the segment of a circle of given radius to find the length of the chord.

CALCULUS.

237. *Prize Problem. Proposed by S. A. COREY, Hiteman, Iowa.

Find an expression for the remainder after n terms in the following development† of $f(a+x)$:

$$\begin{aligned}f(a+x) &= f(a) + \frac{x}{m} \cdot 2 \left\{ f'(a+x) + f'(a) + 2 \left[f'' \left(a + \frac{x}{m} \right) + f'' \left(a + \frac{2x}{m} \right) \right. \right. \\&\quad \left. \left. + f'' \left(a + \frac{3x}{m} \right) + \dots + f'' \left(a + \frac{m-1}{m} x \right) \right] \right\} - \frac{B_1 x^2}{m^2 \cdot 2!} [f''(a+x) - f''(a)] \\&+ \frac{B_2 x^4}{m^4 \cdot 4!} [f^{iv}(a+x) - f^{iv}(a)] - \dots + (-1)^n \frac{B_n x^{2n}}{m^{2n} \cdot (2n)!} [f^{(2n)}(a+x) - f^{(2n)}(a)] \\&+ \dots, B_1, B_2, \dots \text{ being Bernoulli's numbers.}\end{aligned}$$

*In order to emphasize the importance of finding such an expression for the remainder after n terms as will hold good for all integral values of m and approach 0 as m approaches ∞ , and at the same time enable computers to determine absolutely in what cases the development holds, the proposer offers a prize of \$10 for the best solution. ED. F.

†See *Annals of Mathematics*, Second Series, Vol. 5, No. 4, July, 1904.